May '49

RADIATION REPORT

for

SMITH CAMPUS RADIO

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NORTHAMPTON, MASS.

ALBERT D. KING

18 MAY 1949

Mr. William A. Bodden, Treasurer
Smith College
Northampton, Massachusetts

Dear Mr. Bodden:

The accompanying report covers the radiation tests at the Smith College Campus Radio. In line with my original estimate and subsequent authorization, I am also enclosing my bill for $300.

As you know, the equipment was built at my own risk. If the radiation tests were made first, I realize that the station might not have been constructed. It is up to the college now to decide whether they want this equipment. If so, I will complete the present installation; but I must have two weeks to do so and should like to finish it before the first of July. Yet to be done is the addition of one microphone in the announcer's booth, correction of two preamplifiers, correction of tone on local amplifiers, and completion of the intercommunicating system.

The cost of the present equipment, when completed as noted above, will be $3200. This is the amount given in my original report plus the additions requested verbally last year and making a total charge of $2500. If this equipment is not desired by the college, I will remove it by July 1st or earlier, if you wish.

When talking with Miss Butler and Miss Benson, the subject service for the Campus Radio was discussed. This can be done on a basis of labor plus parts, but I suggest an annual fixed fee to include all labor and parts for the present equipment. The cost for this service would be $300 a year payable on ten equal monthly billings, September through June inclusive. This would include, if necessary or requested, two new record turntables and all other parts to keep the equipment in first class condition. Service checks will be made at least once per month to anticipate any possible trouble. The only exclusions would be repair of damaged microphones resulting from falls or other misuse,

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record needles, and emergency service calls because of faulty operator techniques. Of course, if damage results from faulty operation, the repair is covered by the above fee.

Miss Butler says that she hopes to arrange a meeting at your office where the three of us can discuss the entire question of the Smith Campus Radio. Shortly after this, I hope I may hear from you concerning the present equipment.

Very truly yours,

Albert D. King

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Enclosure
ADK:rm

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RADIATION REPORT for SMITH CAMPUS RADIO

The original program for the Smith Campus Radio was to make radiation tests, using input to the 110 volt side of the power lines. This work was to be considered a separate job. Design and construction was then to follow if the radiation tests warranted.

Actually, design and purchase of components was carried out first; based on erroneous reports that other colleges were getting coverage without connecting to the high, 2300 volt, side of the power lines. The compact design necessitated set-up and testing on location. Many methods of coupling, by connections to the 110 volt or low side of the line, were attempted. Radiation was much better during vacations when the lighting load on campus was low. An unorthodox method of inducing some power into the high voltage side, without connections, gave higher campus signal strength than any other method of connecting to the line. This signal was, however, insufficient to give good coverage in distant houses.

A buried radiator, parallel to the power lines gave best coverage. By raising this radiator about ten feet off the ground, good coverage is given to the entire campus. (The tests covered here refer to the buried radiator.)

Because of differences in radios--some old, some new, and some in need of repair--and because of location, the best that should be expected of a campus radio is a signal as strong as standard broadcast stations in the same region of the radio dial. With the buried radiator used for the past month, this condition has been met with the exception of the far ends of one or two houses.

The raised radiator being used tonight should correct this condition and give complete coverage. The signal strength should be higher than most broadcast stations except at a few remote locations. Incidentally, since the first of December 1948, there has been no change in <u>power</u> applied to the radiating system. All changes have been made in an effort to find a more efficient radiating system.

Before discussing FCC requirements and future steps for Smith College, it seems well to note what is happening at other colleges. During the past year, the systems used for campus broadcasting have been investigated by correspondence and by personal visits.

All systems have been developed specifically for a particular campus. Many colleges, even after years "on the air," still have not found ways of covering their campus. At the larger colleges--Harvard, Yale, and

Dartmouth--carrier current is used coupled to the high voltage side of the line. These give good coverage but not without corrections requested by the FCC. Many of the local colleges use an antenna only, although this is a violation of FCC regulations. The presence of this antenna system will not be admitted in formal gatherings, but I personally know of three in the Connecticut Valley region. Another, smaller group, use remote low powered transmitters strategically located around the campus. We are building some of these for Amherst College now. Williams College has a similar arrangement. The disadvantage, in addition to the original cost of the units, is the rental of the telephone lines to carry the control current and audio to the remote R.F. amplifier. This system also involves the use of a variety of frequencies, a separate one for each section of campus. Some of the colleges do not have their own high voltage lines, and so can not couple effectively. The presence of electric meters in college houses is a decided disadvantage in carrier current operation. Fortunately, this condition does not exist at Smith. The best systems, with least trouble and cost, are connected to the high voltage side of the electric wiring system.

The FCC regulations, as they now stand, state that unlicensed radiation shall not, in nontechnical terms, exceed a certain strength at a distance of about 270 feet from the radiating system. In the case of carrier current, this is the electric lighting wires. With a radiating system, this is the wire used as a radiator. The colleges referred to previously, and this also applies to Cornell, exceed this maximum allowable radiation. The FCC is apparently looking the other way until such time as any new regulations may be issued as a result of their recent request for proposed changes. (Docket No. 9388, April 13, 1949.) Changes, if any, may be some time before being promulgated; since there will doubtless be a hearing. This docket also affects laboratory equipment and will meet with considerable opposition.

This report concludes our work on radiation. We find that (1) it is impossible to cover the campus with a signal strength at all receivers as high as broadcast stations in the same frequency region when connected to the low voltage, 110 volt, side of the electrical line. (2) The buried radiator, in use for the past month, still does not give optimum coverage; and its radiation slightly exceeds the present FCC allowable radiation in the immediate vicinity of the radio station. (3) The elevated radiator being used tonight far exceeds the allowable radiation but is still less than that used at some campuses today. (Some of these have been in use for seven to eight years.)

There are two strictly legal methods of improving the coverage. The least expensive is coupling to the high voltage side of the line. It must be pointed out, however, that only a trial will show whether this is

capable, at Smith College, of giving the desired coverage. Other colleges have had to experiment to get the desired results. An installation at a local college was put in by the designer of a successful unit at another college but was found unsatisfactory at the local college. Subsequent engineering resulted in an acceptable design. Such an installation can be made, meeting all Underwriter rules, with the high power still no nearer the radio operators than it is now; and with ample safety factor for protection of the electrical system. As a preliminary estimate, subject to review with college engineers, who will have to do most of the work, this might cost $300 to install at Smith. There is no guarantee, however, that the signal would then be higher than at present. From all data available, this sort of system should be satisfactory.

The use of remote amplifiers, as scheduled for use at Amherst and now being used at Williams, would give good coverage. There will be a continual overhead for telephone line rental, and three to five remote units will be required. Simple units, such as being used at Amherst, will not meet the technical standards now being held at the Smith Campus Radio. It seems advisable to maintain these present standards. Each of these units might cost $300 installed.

It is recommended, that if greater coverage than that of the last month is imperative, connections to the high side of the line should be considered.

Thanks are due Miss Butler and the group of girls who worked for her in preparing the detailed house-by-house and radio-by-radio report which made this report possible.

Respectfully submitted,

Albert D. King

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Registered Professional Engineer

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